CLAIMS

1. A method of operating an automated storage apparatus including at least one data transfer device for transferring data to and from data storage units, a holding area for holding said data storage units for which no data is presently required to be transferred thereto or therefrom, and a reference data storage unit located in said holding area, the method comprising: automatically, in response to receiving information indicative of an excessive error level in transferring data between one said data transfer device and a respective said data storage unit:

a) physically removing from said one data transfer device a data storage unit presently inserted in the transfer device; and

b) physically inserting said reference unit in said one data transfer device for a reference transfer operation.

2. The method of claim 1, comprising causing a data transfer operation to be performed on a storage portion of said reference unit, said storage portion having had a controlled number of transfer operations performed thereon.

3. The method of claim 1, comprising determining, in response to an error level of the reference transfer operation exceeding a threshold whether a cause of said error level lies with said one data transfer device or with said data storage unit last removed from said one data transfer device.

4. The method of claim 1, wherein said storage unit is a multi-function storage unit comprising i) a tape storage medium section having said at least one storage portion and ii) an abrasive cleaning tape section, the method further comprising holding the multi-function storage unit in a dedicated multi-function storage unit holding area, and moving said multi-function storage unit to a data transfer device for use as a cleaning unit or as a reference unit, as the case may be.

5. The method of claim 1 wherein the removing and inserting steps are performed by an automatic device that physically moves said data storage unit.

6. A storage medium storing machine readable instructions adapted to be executed by a digital processor apparatus for causing an automated storage apparatus to perform the method of claim 1.

7. A carrier having stored thereon machine readable instructions adapted to be executed by a digital processor apparatus for causing an automated storage apparatus to perform the method of claim 1.

8. A digital processor apparatus including machine readable instructions for causing an automated storage apparatus to perform the method of claim 1.

9. A logic circuit of interconnected electrically conductive elements for causing an automated storage apparatus to perform the method of claim 1.

10. An automated digital data storage apparatus for moving digital data storage units between a holding area and at least one respective data transfer device for transferring data to and from said data storage units, said apparatus being arranged to:

a) hold and locate in said holding area a reference data storage unit designated for diagnostic use, said reference unit comprising at least one reference storage portion having a controlled number of previous transfer operations performed thereon; and

b) automatically, in response to receiving information indicative of an excessive error level in transferring data between one said data transfer device and a respective said data storage unit:

i) remove from said one data transfer device a presently inserted said data storage unit; and

ii) insert said reference unit in said one data transfer device for a reference transfer operation.

11. The automated digital data storage apparatus of claim 10, arranged to recognize, by virtue of at least one of (i) information held on said reference unit and (ii) the presence of said reference unit in a designated reference unit holding area, that one of said data storage units constitutes said designated reference unit for diagnostic use.

12. The automated digital data storage apparatus of claim 10, arranged to monitor an error level in data transferred during said reference data transfer operation,

and determine thereby whether a cause of the excessive error level is located in said one data transfer device or in the data storage unit last removed from said one data transfer device.

13. The automated digital data storage apparatus of claim 10, arranged to recognize a holding portion of said holding area as constituting a dedicated reference unit holding area.

14. The automated digital data storage apparatus of claim 10, wherein said reference unit is a multi-function storage unit comprising i) a tape storage medium section having said at least one storage portion and ii) spliced to said tape storage medium section, an abrasive cleaning tape section, said automated storage apparatus being arranged to locate the multi-function storage unit in a dedicated multi-function storage unit holding area, for moving said multi-function storage unit to a data transfer device for use as a cleaning unit or as a reference unit, as required.

15. An automated digital data storage apparatus for physically moving digital data storage units between a holding area and at least one respective data transfer device for transferring data to and from said data storage units, said holding area having a region dedicated to receiving one of said storage units that is designated as a reference unit for diagnostic use, said reference unit comprising at least one reference storage portion having had a controlled number of previous transfer operations performed thereon, said apparatus being arranged to:

a) monitor an error level in data transferred between the or each of said data transfer devices and a respective one of said data storage units;

b) automatically, in response to an error level at one said transfer device exceeding a predetermined threshold:

i) remove from said one data transfer device a presently inserted said data storage unit; and

ii) insert in said one data transfer device said reference unit.

16. An automated digital data storage apparatus for moving digital data storage units between a holding area and at least one respective data transfer device for transferring data to and from said data storage units, said apparatus being arranged to:

a) hold and locate in said holding area one of said data storage units that is designated as a reference unit for diagnostic use, said reference unit comprising at least one reference storage portion having had a controlled number of previous transfer operations performed thereon; and

b) automatically, in response to receiving information indicative of an excessive error level in transferring data between one said data transfer device and a respective said data storage unit:

i) remove from said one data transfer device a presently inserted said data storage unit;

ii) insert said reference unit in said one data transfer device for a reference transfer operation;

c) the automated digital data storage apparatus being further arranged to recognize, by virtue of at least one of (i) information held on said reference unit and (ii) the presence of said reference unit in a designated reference unit holding area, that said data storage unit is said designated reference unit for diagnostic use.

17. An automated digital data storage apparatus for physically moving digital data storage units between a holding area and at least one respective data transfer device for transferring data to and from said data storage units, said holding area having a region dedicated to receiving one of said storage units that is designated as a reference unit for diagnostic use, said reference unit comprising at least one reference storage portion having had a controlled number of previous transfer operations performed thereon, said apparatus being arranged to:

a) monitor an error level in data transferred between the or each of said data transfer devices and a respective one of said data storage unit;

b) automatically, in response to an error level at one said transfer device exceeding a predetermined threshold:

i) remove from said one data transfer device a presently inserted one of said data storage units; and

ii) insert in said one data transfer device said reference unit and perform a reference transfer operation;

c) the automated digital data storage apparatus being further arranged to monitor a further error level in data transferred during said reference data transfer

operation, and the further error level and said first-mentioned error level to determine whether a cause of the excessive first-mentioned error level is located in said one data transfer device or in the data storage unit last removed from said one data transfer device.

18. A method of operating an automated storage apparatus comprising at least one data transfer device for transferring data to and from data storage units, a holding area for holding said data storage units for which no data is presently required to be transferred thereto or therefrom, and a reference data storage unit held in said holding area, the method comprising: automatically, in response to receiving information indicative of an excessive error level in transferring data between one said data transfer device and a respective said data storage unit:

a) physically removing from said one data transfer device a presently inserted said data storage unit; and

b) physically inserting said reference unit in said one data transfer device for a reference transfer operation; and

c) performing a data transfer operation on a storage portion of said reference unit, said storage portion having had a controlled number of transfer operations performed thereon.

19. The method of claim 18 wherein the removing and inserting steps are performed by an automatic device that physically moves said data storage unit.